SUSCEPTIBILITY RATING OF FORESTS IN NORTH CAROLINA TO GYPSY MOTH DEFOLIATION

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ABSTRACT

Commercial forests in North Carolina are rated for susceptibility to defoliation by low level gypsy moth populations. Areas most likely to be defoliated are suitable for population buildup and, therefore, may serve as foci of outbreaks. The Mountain and Piedmont regions have a greater amount of highly susceptible commercial forest than the Coastal Plain.

INTRODUCTION

Larvae of the gypsy moth, Lymantria dispar L., defoliate hardwoods in the spring, and in the northeastern U.S., finish feeding by late June. Affected trees normally put forth a new complement of leaves, but the energy required to produce these leaves and the loss of photosynthate from the first set greatly reduce subsequent growth (Wargo, 1981). In addition to causing growth loss and possibly tree mortality, the gypsy moth is especially annoying to the public when large numbers of larvae occur in urban and recreation areas.

It appears to be only a matter of time before the gypsy moth becomes established in North Carolina. It is now established in the northern tier counties of Virginia, where male moths have been trapped in most counties, and multiple life stages have been reported along the Eastern Seaboard. In North Carolina, male moths have been trapped, and all other life stages have been found in several locations.

The pattern of spread is well known. Spot infestations, those in advance of the leading edge of the generally infested area, are usually begun through the introduction of gypsy moth life stages by people--on vehicles, camping equipment, outdoor furniture, etc. Therefore, these infestations are usually centered around urban and recreation areas, regardless of the conditions of the surrounding forest type. However, once the entire region becomes generally infested, certain forest stands or conditions are more susceptible to defoliation than others, especially when gypsy moth populations are low. When the population reaches epidemic levels, the insect will invade and heavily defoliate a greater variety of forest stands.

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This report identifies areas of forested land in North Carolina which are most suitable for gypsy moth population increase after the state is generally infested. In the most susceptible forest stands, the appropriate tree species are abundant and conditions do not favor natural enemies. Historically, gypsy moth populations have increased in such stands, which may have served as foci of outbreaks (Valentine and Houston, 1981). During outbreaks, all hardwood stands may be defoliated, but when populations are low, fewer stands are susceptible.

In this report, we identify the portions of North Carolina's forests that are susceptible to defoliation by low populations of gypsy moth. The identification of these areas, which may serve as foci for outbreaks, may help land managers develop plans for dealing with the gypsy moth. We also identify the portion of susceptible forest that is located near people, because this is the area where the greatest control effort will be directed.

Definition of Susceptibility

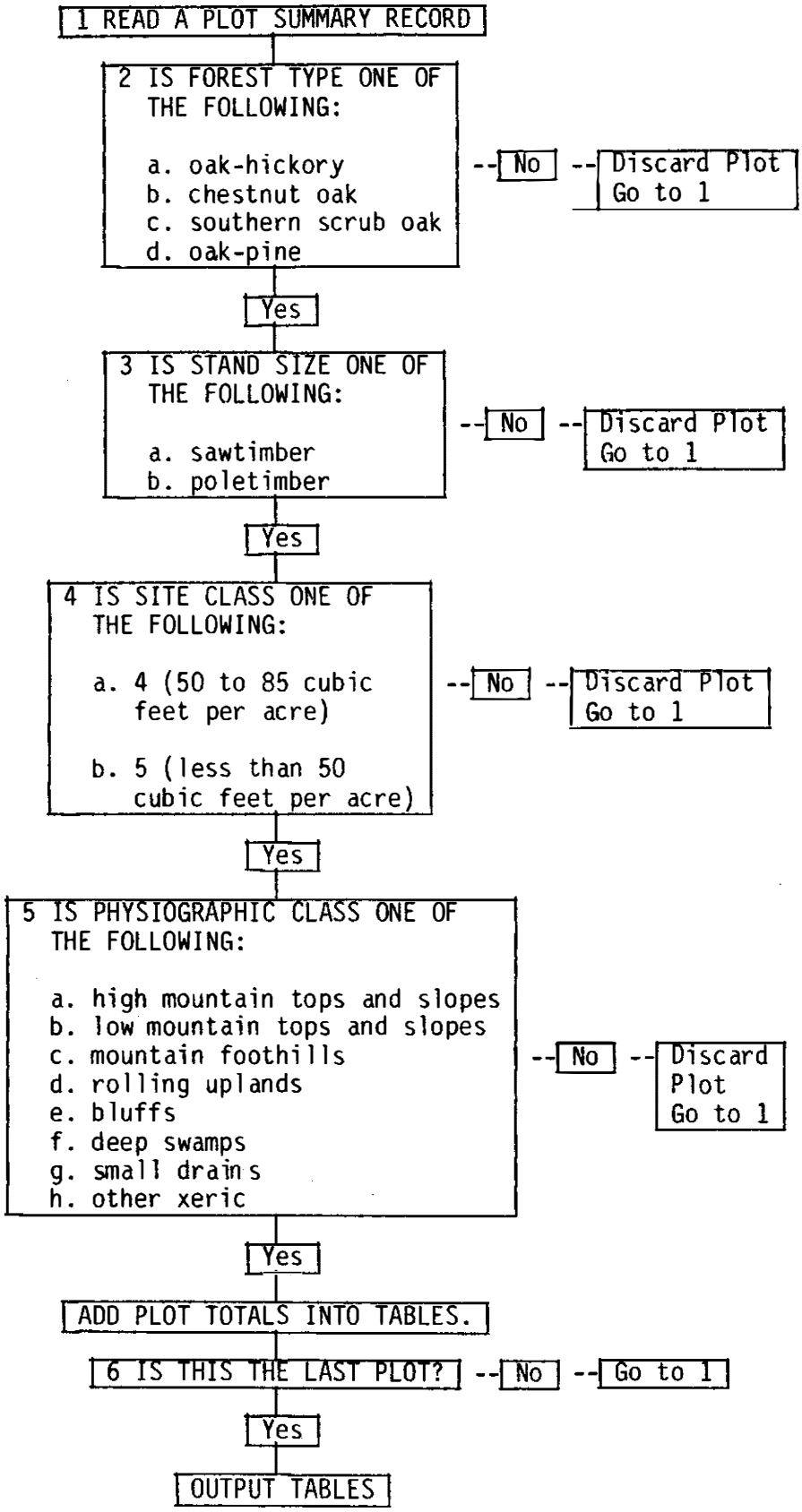
The characteristics of susceptible stands have been identified in the Northeast (Houston and Valentine, 1977). By comparing conditions in stands having various degrees of defoliation, particular species complexes and site conditions were found that favor population increase and subsequent severe defoliation. Gypsy moths attack stands that have a favorable species composition for food and protective niches. Population increase is also dependent on a lack of natural mortality factors--predators, parasites, and diseases.

Houston and Valentine (1977) have shown that forest stands with a large white oak component, growing on dry sites with shallow and/or rocky soils, are most susceptible. White oak is a preferred host because its leaves have a high nutritional value, and because its rough, scaly bark provides many protective niches for the various life stages of the gypsy moth. On marginal sites (dry ridges, sandy soils, steep slopes, etc.), trees grow slowly, and slow-growing trees tend to have more crooks and looser bark, which provide protective niches for the gypsy moth. A more susceptible stand also does not provide many favorable hiding places for parasites and predators. For instance, if there is a scarcity of litter and debris, then beneficial insect and rodent populations will be low or absent.

METHODS

The Forest Inventory and Analysis (FIA) project at the Southeastern Forest Experiment Station collects stand information by surveying a number of systematically distributed sample locations throughout each state in the Southeast on a periodic basis. North Carolina was last surveyed in 1974. A Forest Information Retrieval (FIR) system was used to select the most susceptible portion of commercial forest land. The FIR system is a customized data retrieval service offered by FIA for compiling numerous forest statistics for any geographic area of interest. The system also offers the user the flexibility of selecting any combination of stand conditions as screening criteria. Stands which do not meet the specified conditions are excluded from the final data compilations. This feature of the FIR system was used to identify those stands most favorable for gypsy moth population increase. The screening procedure is described in flow diagram format in Figure 1. The state was broken into three regions--Coastal Plain, Piedmont, and Mountain--for the analysis. Tables were

Figure 1--Each plot record within the specified area (coastal plain, piedmont, or mountain) is subjected to this series of questions.



generated for each region, and information about the susceptible forest is presented on a county-by-county basis.

Screening criteria were selected which reflect susceptible forest conditions, and these were applied to the 1974 FIA data for the state of North Carolina. The forest types used (oak-hickory, oak-pine, chestnut oak, and southern scrub oak) represent known susceptible species complexes. Stand and site conditions which increase susceptibility were represented by stands capable of producing no more than 85 cubic feet of wood per acre annually (site classes 4 and 5) and by physiographic class (high mountain tops and slopes, low mountain tops and slopes, mountain foothills, rolling uplands, bluffs, other xeric sites, and also deep swamps and small drainages). Stand size (sawtimber and poletimber) was also used as a screening criteria. It is felt that the combination of these forest types and site/stand conditions will select areas which are most susceptible to gypsy moth population increase and defoliation. These forest stands will provide food in the preferred host species, and the trees will quite likely have poor growth form, which provides protective niches for the life stages of the gypsy moth.

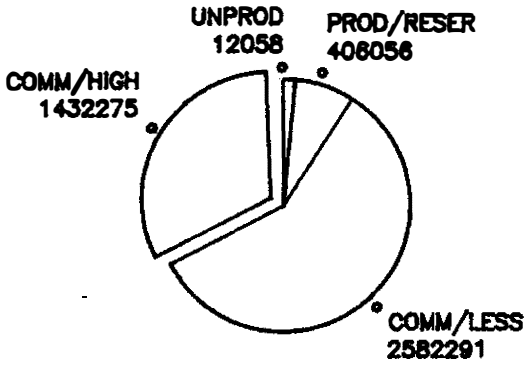
A second screening was run to determine how much susceptible forest was located near urban and recreation areas. Only stands that met all screening criteria for susceptibility and had urban buildup or productive/reserved forest land (see Definition of Terms) within a 50-acre circle from the stand's center were selected.

RESULTS AND DISCUSSION

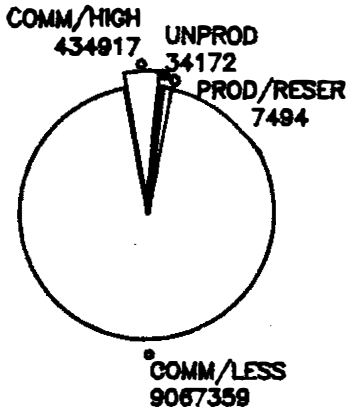
Approximately one-third of the forested land in the Mountain and Piedmont regions of North Carolina is highly susceptible to gypsy moth defoliation. Only 5 percent of the forest is rated as highly susceptible in the Coastal Plain (Figure 2). The map of North Carolina in Figure 3 indicates, on a county-by-county basis, the amount of commercial forest land most susceptible to gypsy moth population increase and defoliation. Counties which have the greatest proportion (51-75%) of highly susceptible forest land are shown in green; counties with 26-50 percent highly susceptible forest are in yellow; and those counties with 0-25 percent highly susceptible forest are in white. No county had more than 75 percent of the commercial forest rated as highly susceptible to population increase and defoliation.

Acreage of forested land in each county and its distribution among the three forest classes--commercial, unproductive, and productive/reserved--is shown in Tables 1-3 in the Appendix. The FIR system screened the commercial forest land for susceptibility, and acreage of susceptible commercial forest for each county is also presented in Tables 1-3. In some counties, such as Swain in the Mountain region, there are large areas of forest classified as productive/reserved. The productive/reserved forest is not included in the screening process, but it undoubtedly will have some stands which are susceptible to defoliation. Therefore, some highly susceptible stands will not be included in the estimated figures for highly susceptible forest land.

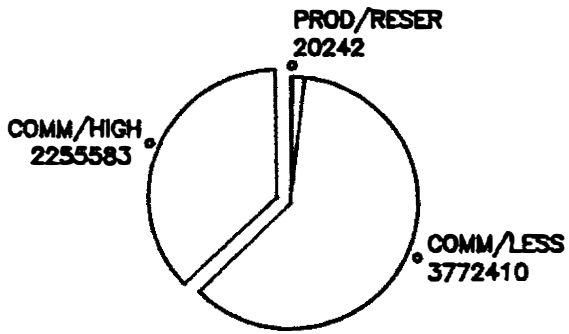
Figure 2. Acres of forested land in North Carolina rated for susceptibility to gypsy moth defoliation.



MOUNTAIN REGION



COASTAL PLAIN



PIEDMONT REGION

KEY

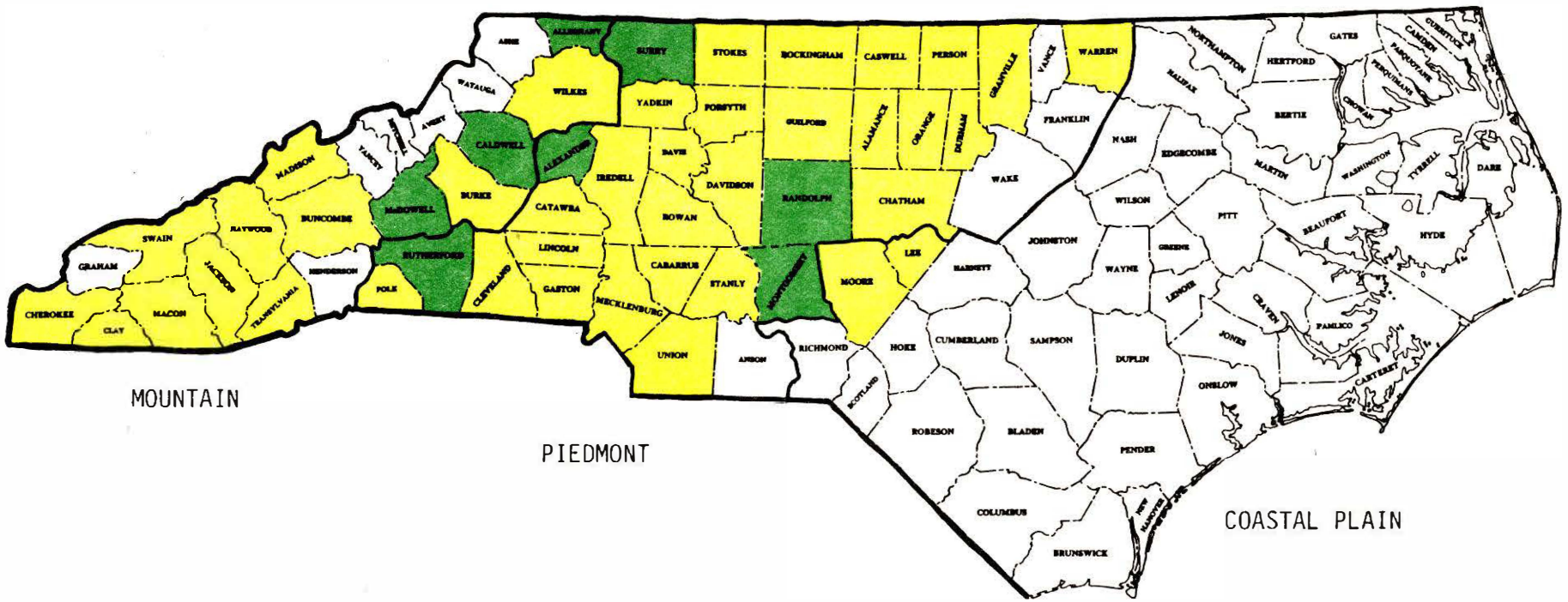
UNPRODuctive

PRODuctive/RESERved

COMMercial/HIGHly susceptibl

COMMercial/LESS susceptible

Figure 3.--The portion of commercial forest land which is highly susceptible to gypsy moth population increase and defoliation is indicated for each county in North Carolina. Green indicates that 51-75% of the commercial forest is highly susceptible. Yellow indicates that 26-50% of the commercial forest is highly susceptible. White indicates that 0-25% of the commercial forest is highly susceptible to defoliation or that there is no highly susceptible type.



In general, farmers and miscellaneous private owners own most of the highly susceptible forest land, but they also own the majority of the commercial forest. Federal ownership of highly susceptible forest land is significant only in the Mountain region, where approximately 20 percent of susceptible forest land is in the National Forests (Figure 4). The ownership pattern of susceptible forest land within each county is shown in Tables 4-6 in the Appendix.

The Piedmont has the greatest volume of timber in the highly susceptible category, followed by the Mountains and Coastal Plain (Figures 5 and 6). The volumes of sawtimber and all growing stock in the highly susceptible forests for each county are given in Tables 7-9 in the Appendix.

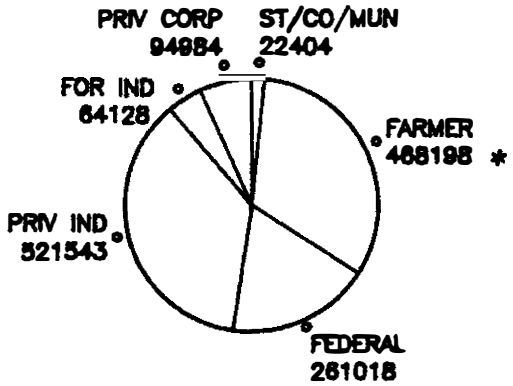
The second analysis indicates that only a small portion of the highly susceptible forest is located near urban buildup or recreation areas (Figure 7). These areas are of special interest, because once the state is generally infested, initial allocation of control resources will be directed here. Traditionally, the gypsy moth has been a "people problem." In the Northeast, where eradication is no longer feasible, control projects are politically motivated and/or economically justified only in urban and recreation areas to reduce the nuisance caused by the insect and to protect foliage. The areas we have identified will need primary attention, because gypsy moth populations will probably begin to increase here first. This will result in a heightened public awareness of the problem and similar increase in political pressure to implement control projects. Acreage, by county, of susceptible forest near urban and recreation areas is given in Tables 10, 11, and 12 in the Appendix.

Landowners and land managers can place their particular forested acreages in the highly susceptible category by comparing their forest characteristics to those mentioned previously in the Definition of Susceptibility section and the screening criteria in the METHODS section.

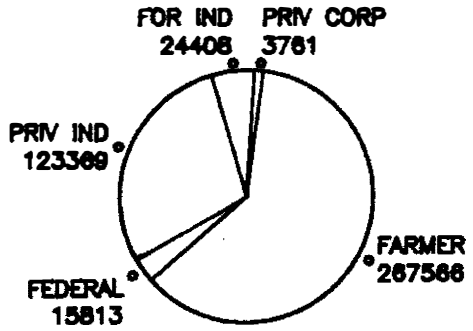
SUMMARY

Data collected by the Forest Inventory and Analysis project and evaluated through the Forest Information Retrieval system were used to identify the portion of forested land in North Carolina which is most susceptible to gypsy moth population increase and defoliation. But how does susceptibility to defoliation relate to vulnerability or mortality? It has been shown that under similar defoliation regimes with no additional environmental stress there is no difference in the likeliness of mortality occurring in stands having different degrees of susceptibility to defoliation. Mortality following defoliation is dependent on a number of interacting factors: tree species, condition of the tree prior to defoliation, number and severity of previous defoliations, the occurrence of environmental stress before and/or during defoliation, and the presence of secondary organisms. It appears that mortality occurs when defoliated trees are already under stress, and secondary organisms are present and ready to attack after the gypsy moth (Houston, 1981). In order to estimate mortality due to gypsy moth activity, information on these factors must be incorporated into a predictive model. The figures presented in this report are estimates of acreage and volume which are most susceptible to population increase and subsequent defoliation by the gypsy moth, and not predictions of mortality. The next step in the risk rating process would be to predict losses to the gypsy moth in individual stands of interest using a model such as the one developed by Herrick, Gansner, and Debald (1979).

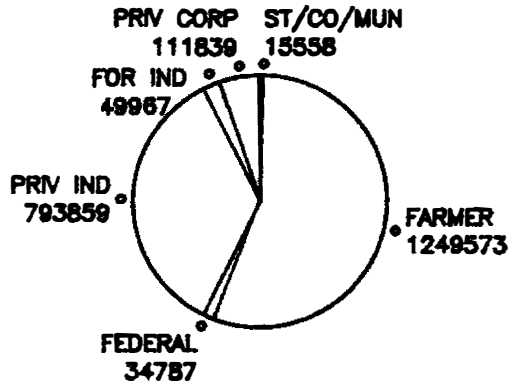
Figure 4. Ownership patterns of forest land in North Carolina rated as highly susceptible to gypsy moth defoliation.



MOUNTAIN REGION



COASTAL PLAIN



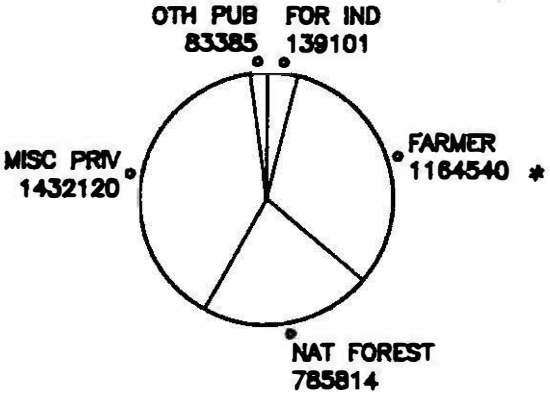
PIEDMONT REGION

KEY

STate/COunty/MUNicipal
PRIVate INDIVidual
FORest INDustry
PRIVate CORPoration

* *acres*

Figure 5. Volumes of hardwood sawtimber, by ownership class, in forests highly susceptible to gypsy moth defoliation.



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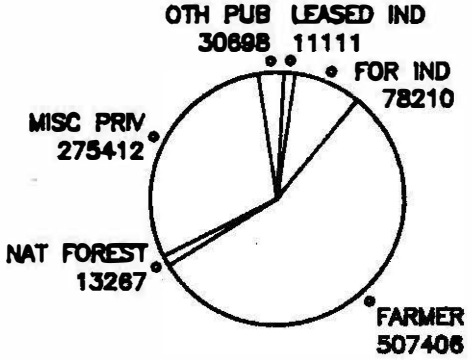

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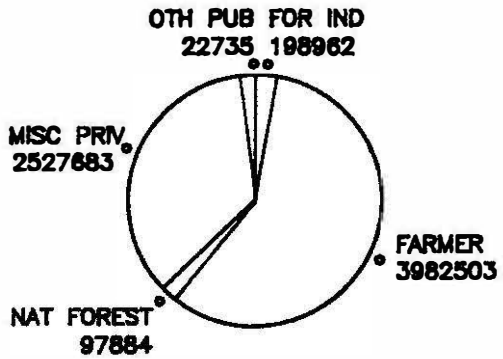


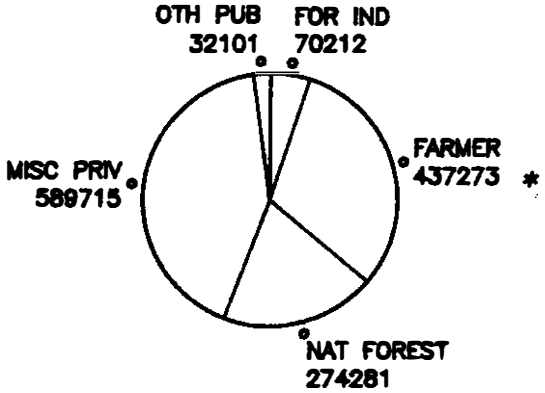
PIEDMONT REGION

KEY

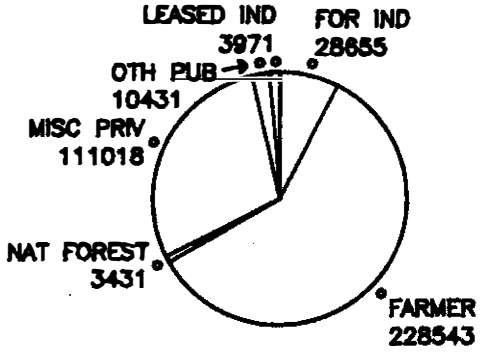
FORest INDustry
NATional FOREST
MISCellaneous PRIVate
OTHer PUBlic lands
LEASED to INDustry

** volumes are in thousand board feet*

Figure 6. Volumes of hardwood growing stock, by ownership class, in forests highly susceptible to gypsy moth defoliation.



MOUNTAIN REGION



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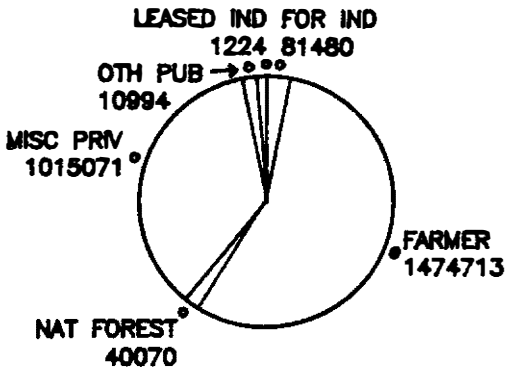


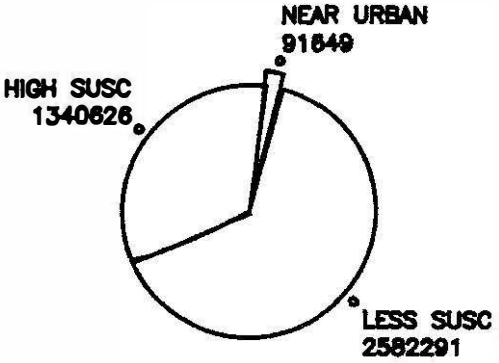
PIEDMONT REGION

KEY

FORest INDustry
NATional FOREST
MISCellaneous PRIVate
OTHer PUBlic lands
LEASED to INDustry

** volumes are in thousand cubic feet*

Figure 7. Acres of commercial forest in North Carolina rated for susceptibility to defoliation and proximity to urban buildup and recreation areas.



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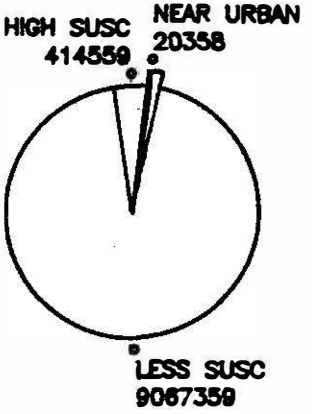

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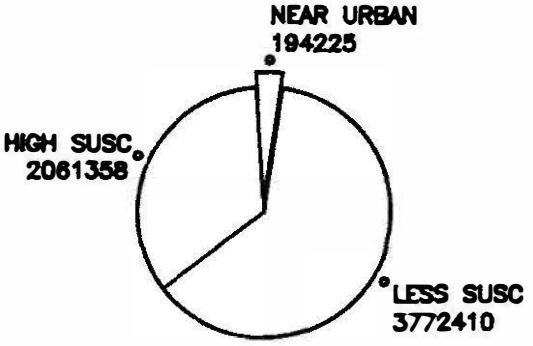

PIEDMONT REGION

KEY

LESS SUSCeptible
HIGHly SUSCeptible
NEAR URBAN and recreation areas and highly susceptible

Definitions of Terms

Commercial forest land. Forest land producing or capable of producing crops of industrial wood and not withdrawn from timber utilization.

Farm. Lands on which agriculture operations are being conducted and sale of agriculture products totaled $1,000 or more during the year.

Farm operator. A person who operates a farm, either doing the work himself or directly supervising the work.

Farm-owned lands. Lands owned by farm operators.

Forest industry lands. Lands owned by companies or individuals operating wood-using plants.

Forest land. Land at least 16.7 percent stocked by forest trees of any size, or formerly having had such tree cover, and not currently developed for nonforest use.

Forest type. A classification of forest land based upon the species forming a plurality of live-tree stocking.

Oak-pine. Forests in which hardwoods (usually upland oaks) comprise a plurality of the stocking, but in which pines comprise 25 to 50 percent of the stocking. (Common associates include gum, hickory, and yellow-poplar.)

Oak-hickory. Forests in which upland oaks or hickory, singly or in combination, comprise a plurality of the stocking, except where pines comprise 25 to 50 percent, in which case the stand would be classified oak-pine. (Common associates include yellow-poplar, elm, maple, and black walnut.)

Growing-stock trees. Live trees of commercial species qualifying as desirable or acceptable trees.

Growing-stock volume. Net volume in cubic feet of growing-stock trees 5.0 inches d.b.h. and over from a 1-foot stump to a minimum 4.0-inch top diameter outside bark of the central stem, or to the point where the central stem breaks into limbs. (Net volume in primary forks is included.)

Hardwoods. Dicotyledonous trees, usually broad-leaved and deciduous.

Soft hardwoods. Soft-textured hardwoods such as boxelder, red and silver maple, buckeye, hackberry, loblolly-bay, silverbell (in mountains), butternut, sweetgum, yellow-poplar, cucumbertree, magnolia, sweetbay, water tupelo, blackgum, sycamore, cottonwood, black cherry, willow, basswood, and elm.

Hard hardwoods. Hard-textured hardwoods such as Florida and sugar maple, birch, hickory, dogwood, persimmon (forest-grown), beech, ash, honey-locust, holly, black walnut, mulberry, all commercial oaks, and black locust.

Miscellaneous federal lands. Federal lands other than National Forests, lands administered by the Bureau of Land Management, and Indian lands.

Miscellaneous private lands - corporate. Lands owned by private corporations other than forest industry.

Miscellaneous private lands - individual. Privately owned lands other than forest industry, farmer-owned, or corporate lands.

National Forest lands. Federal lands which have been legally designated as National Forests or purchase units and other lands under the administration of the Forest Service, including experimental areas and Bankhead-Jones Title III lands.

Other public lands. Publicly owned lands other than National Forests.

Poletimber trees. Growing-stock trees of commercial species at least 5.0 inches d.b.h., but smaller than sawtimber size.

Productive/reserved forest land. Forest land sufficiently productive to qualify as commercial forest land, but withdrawn from timber utilization through statute or administrative designation; includes parks and campgrounds not considered in urban buildup.

Sawtimber trees. Live trees of commercial species containing at least a 12-foot sawlog, or two noncontiguous sawlogs, each 8 feet or longer, and with at least one-third of the gross board-foot volume between the 1-foot stump and minimum sawlog top being sound. Softwoods must be at least 9.0 inches and hardwoods at least 11.0 inches d.b.h.

Sawtimber volume. Net volume of the sawlog portion of live sawtimber in board-foot International 1/4-inch rule.

Site class. A classification of forest land in terms of inherent capacity to grow crops of industrial wood based on fully stocked, natural stands.

Class 4. Sites capable of producing 50 to 85 cubic feet per acre annually.

Class 5. Sites incapable of producing 50 cubic feet per acre annually, but excluding unproductive sites.

Stand-size class. A classification of forest land based on the size class of growing-stock trees on the area.

Sawtimber stands. Stands at least 16.7 percent stocked with growing-stock trees, with one-half or more of total stocking in sawtimber or poletimber trees, and with sawtimber stocking at least equal to poletimber stocking.

Poletimber stands. Stands at least 16.7 percent stocked with growing-stock trees, of which one-half or more of this stocking is in poletimber and sawtimber trees, and with poletimber stocking exceeding that of sawtimber.

State, county, and municipal lands. Lands owned by states, counties, and local public agencies or municipalities, or lands leased to these governmental units for 50 years or more.

Unproductive forest land. Forest land incapable of producing 20 cubic feet per acre of industrial wood under natural conditions because of adverse site conditions.

Urban buildup. Residential, industrial, and recreation developments. Strip mining operations. Includes areas with concentrations of houses, cabins, or vacation homes.

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APPENDIX

Table 1.--Mountains - Area of commercial forest land classified as highly susceptible to defoliation, by county.

County	Acres of Forest Land			Acres of Commercial Forest		Acres Classified as Highly Susceptible to Defoliation		% of Forest Type Highly Susceptible to Defoliation		% of Commercial Forest Highly Susceptible to Defoliation
	Commercial	Unproductive	Productive/ reserved	Oak/Hickory Type*	Oak/Pine Type	Oak/Hickory Type	Oak/Pine Type	Oak/Hickory Type	Oak/Pine Type	
Alleghany	71,030	-	3,791	63,138	-	47,355	-	75	-	67
Ashe	154,140	-	1,696	132,131	-	29,426	-	22	-	19
Avery	126,385	50	2,052	108,013	-	18,373	-	17	-	15
Buncombe	280,469	1,220	12,628	232,025	15,734	71,667	15,734	31	100	31
Burke	251,909	489	9,442	164,467	2,822	94,894	2,822	58	100	39
Caldwell	244,711	-	243	180,385	36,794	140,683	35,736	78	97	72
Cherokee	256,033	7	2,410	152,807	59,060	71,804	24,565	47	42	38
Clay	109,177	512	3,055	76,986	-	38,493	-	50	-	35
Graham	154,919	497	22,647	104,297	6,366	23,913	6,366	23	100	20
Haywood	189,193	1,041	82,689	141,332	5,027	46,660	5,027	33	100	27
Henderson	157,562	29	245	119,170	14,410	28,820	7,205	24	50	23
Jackson	260,962	527	4,770	233,823	5,333	107,645	-	46	-	41
McDowell	225,505	552	1,872	165,576	45,401	75,388	40,859	46	90	52
Macon	261,487	2,725	9,747	246,118	15,369	100,876	5,898	41	38	41
Madison	214,265	52	274	145,990	13,626	61,680	-	42	-	29
Mitchell	108,733	426	1,497	80,948	-	14,473	-	18	-	13
Swain	106,821	451	213,063	79,863	-	38,266	-	48	-	36
Transylvania	203,292	2,596	11,313	178,898	17,316	89,684	10,238	50	59	49
Watauga	121,850	-	7,085	97,927	-	7,903	-	8	-	6
Wilkes	370,646	-	6,542	175,745	101,125	82,101	78,565	47	78	43
Yancey	145,477	884	8,995	92,033	9,156	-	9,156	-	100	6
All Counties	4,014,566	12,058	406,056	2,971,672	347,539	1,190,104	242,171	40	70	36

* The chestnut oak forest type is included under the oak/hickory forest type.

Table 2.--Piedmont - Area of commercial forest land classified as highly susceptible to defoliation, by county.

County	Acres of Forest Land			Acres of Commercial Forest		Acres Classified as Highly Susceptible to Defoliation		% of Forest Type Highly Susceptible to Defoliation		% of Commercial Forest Highly Susceptible to Defoliation
	Commercial	Unproductive	Productive/ reserved	Oak/Hickory Type*	Oak/Pine Type	Oak/Hickory Type	Oak/Pine Type	Oak/Hickory Type	Oak/Pine Type	
Alamance	134,442	-	12	52,105	15,211	45,631	15,211	88	100	45
Alexander	108,282	-	8	61,400	7,178	50,558	7,178	82	100	53
Anson	233,794	-	-	92,427	20,931	21,140	-	23	-	9
Cabarrus	104,783	-	-	69,607	11,600	34,803	5,800	50	50	39
Caswell	178,640	-	-	61,460	35,267	39,510	17,707	64	50	32
Catawba	115,461	-	-	51,944	17,144	34,800	11,429	67	67	40
Chatham	327,980	-	-	121,137	35,340	98,880	22,938	82	65	37
Cleveland	130,302	-	10	47,210	18,628	23,924	9,314	51	50	26
Davidson	190,345	-	9	113,446	10,053	82,328	5,026	73	50	46
Davie	76,249	-	-	38,260	4,277	29,831	4,277	78	100	45
Durham	113,746	-	-	33,435	27,993	15,771	15,770	47	56	28
Forsyth	114,768	-	199	65,305	8,708	52,245	4,354	80	50	49
Franklin	192,623	-	-	65,200	20,062	20,062	10,031	31	50	16
Gaston	124,264	-	956	46,503	22,821	19,117	13,693	41	60	26
Granville	218,298	-	-	71,091	28,819	33,455	28,819	47	100	29
Guilford	198,693	-	691	78,246	29,058	44,345	24,215	57	83	35
Iredell	169,266	-	1,328	81,041	24,890	56,152	18,667	69	75	44
Lincoln	90,695	-	8	36,850	13,431	23,418	13,431	64	100	41
Mecklenburg	152,326	-	388	65,692	28,878	28,876	14,439	44	50	28
Montgomery	248,731	-	633	116,102	55,383	89,730	51,810	77	94	57
Orange	150,303	-	216	60,258	29,544	35,150	27,466	58	93	42
Person	160,831	-	-	74,295	34,666	40,076	19,809	54	57	37
Polk	111,541	-	-	46,776	22,374	16,678	13,424	36	60	27
Randolph	316,013	-	1,134	232,566	20,863	177,735	15,647	76	75	61
Rockingham	231,197	-	-	91,501	35,399	61,152	17,342	67	49	34
Rowan	153,149	-	82	93,954	-	52,446	-	56	-	34
Rutherford	253,859	-	-	114,496	39,884	93,876	36,085	82	90	51
Stanly	121,124	-	4,087	77,424	5,144	51,446	-	66	-	42
Stokes	189,985	-	4,050	107,965	13,482	72,013	13,482	67	100	45
Surry	213,345	-	918	109,530	54,378	79,868	29,662	73	55	51
Union	186,077	-	26	97,970	11,466	52,107	11,466	53	100	34
Vance	99,343	-	-	25,836	8,167	15,502	3,000	60	37	19
Wake	306,332	-	5,487	97,678	38,533	57,796	19,267	59	50	25
Warren	202,754	-	-	53,139	65,865	24,153	43,478	45	66	33
Yadkin	108,452	-	-	36,772	11,946	30,799	5,973	84	50	34
All Counties	6,027,993	-	20,242	2,688,621	827,383	1,705,373	550,210	63	67	37

* The chestnut oak type is included under the oak/hickory forest type.

Table 3.--Coastal Plain - Area of commercial forest land classified as highly susceptible to defoliation, by county.

County	Acres of Forest Land			Acres of Commercial Forest		Acres Classified as Highly Susceptible to Defoliation		% of Forest Type Highly Susceptible to Defoliation		% of Commercial Forest Highly Susceptible to Defoliation
	Commercial	Unproductive	Productive/ reserved	Oak/Hickory Type*	Oak/Pine Type	Oak/Hickory Type	Oak/Pine Type	Oak/Hickory Type	Oak/Pine Type	
Beaufort	337,745	-	-	40,769	64,758	-	-	-	-	-
Bertie	319,754	-	-	73,179	54,223	2,764	-	4	-	1
Bladen	433,598	-	1,932	27,531	59,476	-	7,400	-	12	2
Brunswick	430,862	-	-	20,366	18,501	-	-	-	-	-
Camden	97,680	-	-	13,537	2,811	-	-	-	-	-
Carteret	231,823	4,858	255	2,861	43,006	-	-	-	-	-
Chowan	58,099	-	-	25,324	9,934	-	-	-	-	-
Columbus	417,463	-	-	33,183	52,672	6,759	2,985	20	6	2
Craven	333,361	-	-	42,531	47,928	1,945	2,093	5	4	1
Cumberland	238,213	-	156	28,249	34,370	6,122	6,822	22	20	5
Currituck	77,876	1,305	-	6,327	7,339	-	-	-	-	-
Dare	156,426	18,635	807	-	41,167	-	-	-	-	-
Duplin	311,412	-	-	49,652	50,972	4,034	-	8	-	1
Edgecombe	153,397	-	-	34,650	20,928	5,232	7,848	15	38	9
Gates	156,206	-	-	19,036	13,256	-	-	-	-	-
Greene	77,178	-	-	17,466	17,466	3,493	-	20	-	5
Halifax	277,185	-	-	96,042	43,983	22,820	19,173	24	44	15
Harnett	212,109	-	2,378	93,923	34,379	40,629	-	43	-	19
Hertford	145,722	-	-	44,053	32,699	-	-	-	-	-
Hoke	159,462	-	-	26,338	28,554	2,739	4,953	10	17	5
Hyde	244,864	672	-	7,743	7,745	-	-	-	-	-
Johnston	263,120	-	-	59,546	56,041	14,012	21,014	24	37	13
Jones	231,867	-	-	30,857	22,884	-	-	-	-	-
Lee	111,918	-	-	57,430	22,066	40,453	11,033	70	50	46
Lenoir	122,914	-	-	18,623	24,832	-	-	-	-	-
Martin	188,452	-	-	28,785	25,584	2,879	-	10	-	2
Moore	341,762	-	423	127,312	51,057	79,446	12,359	62	24	27
Nash	182,616	-	-	72,346	33,044	22,089	12,016	31	36	19
New Hanover	60,312	-	237	7,645	7,645	-	-	-	-	-
Northhampton	210,029	-	-	73,536	37,844	13,892	10,900	19	29	12
Onslow	377,046	-	30	7,048	41,005	-	3,524	-	9	1
Pamlico	147,115	1,356	-	16,278	19,840	-	-	-	-	-
Pasquotank	72,178	-	-	15,713	6,246	-	-	-	-	-
Pender	450,785	-	32	17,170	31,430	-	-	-	-	-
Perquimans	86,672	-	-	26,817	13,228	-	-	-	-	-
Pitt	198,825	-	-	34,031	27,217	-	-	-	-	-

Table 3.--con't

County	Acres of Forest Land			Acres of Commercial Forest		Acres Classified as Highly Susceptible to Defoliation		% of Forest Type Highly Susceptible to Defoliation		% of Commercial Forest Highly Susceptible to Defoliation
	Commercial	Unproductive	Productive/ reserved	Oak/Hickory Type*	Oak/Pine Type	Oak/Hickory Type	Oak/Pine Type	Oak/Hickory Type	Oak/Pine Type	
Richmond	219,309	-	-	62,542	20,418	16,700	7,436	27	36	11
Robeson	297,421	-	-	37,741	30,879	-	-	-	-	-
Sampson	358,571	-	-	59,440	73,727	-	-	-	-	-
Scotland	124,464	-	-	24,294	12,148	3,037	-	13	-	2
Tyrell	213,411	2,605	539	8,698	30,589	-	-	-	-	-
Washington	116,462	4,741	155	10,616	5,225	-	-	-	-	-
Wayne	152,111	-	550	45,748	11,793	10,960	-	24	-	7
Wilson	104,481	-	-	43,600	18,034	2,678	2,678	6	15	5
All Counties	9,502,276	34,172	7,494	1,588,576	1,308,943	302,683	132,234	19	10	5

* The southern scrub oak forest type is included under the oak/hickory forest type.

Table 4.--Mountains - Acres of commercial forest land classified as highly susceptible to defoliation, by ownership and county.

County	All Ownerships	National Forest	Misc. Federal	State	County and Municipal	Forest Industry	Farmer	Misc. Pri. Corporate	Misc. Pri. Individual
Alleghany	47,355	-	-	6	-	-	31,566	7,891	7,892
Ashe	29,426	-	-	80	2	-	22,008	-	7,336
Avery	18,373	-	-	-	-	-	-	9,186	9,187
Buncombe	87,401	-	-	-	8,727	-	31,469	-	47,205
Burke	97,716	-	-	-	-	2,822	25,881	8,626	60,387
Caldwell	176,419	16,409	-	-	-	22,349	20,649	6,883	110,129
Cherokee	96,369	34,754	-	-	-	2,813	49,002	-	9,800
Clay	38,493	21,129	-	-	-	-	5,788	5,788	5,788
Graham	30,279	17,547	-	-	-	-	6,366	-	6,366
Haywood	51,687	10,055	-	-	4,593	-	18,519	-	18,520
Henderson	36,025	-	-	-	-	-	14,410	-	21,615
Jackson	107,645	16,002	17,427	524	1,009	-	29,072	7,269	36,342
McDowell	116,247	5,474	-	-	-	9,083	36,319	7,264	58,107
Macon	106,774	53,077	-	-	-	-	26,847	-	26,850
Madison	61,680	13,482	-	-	-	-	48,198	-	-
Mitchell	14,473	7,527	-	-	-	-	6,946	-	-
Swain	38,266	6,674	18,997	-	955	-	5,820	-	5,820
Transylvania	99,922	20,185	-	-	261	8,697	21,234	35,389	14,156
Watauga	7,903	-	-	-	-	-	7,903	-	-
Wilkes	160,666	-	2,279	6,133	114	18,364	60,201	6,688	66,887
Yancey	9,156	-	-	-	-	-	-	-	9,156
All Counties	1,432,275	222,315	38,703	6,743	15,661	64,128	468,198	94,984	521,543

Table 5.--Piedmont - Acres of commercial forest land classified as highly susceptible to defoliation, by ownership and county.

County	All Ownerships	National Forest	Misc. Federal	State	County and Municipal	Forest Industry	Farmer	Misc. Pri. Corporate	Misc. Pri. Individual
Alamance	60,842	-	-	-	-	-	40,561	-	20,281
Alexander	57,736	-	-	-	12	3,514	27,105	-	27,105
Anson	21,140	-	-	-	-	-	16,912	-	4,228
Cabarrus	40,603	-	-	-	-	-	17,402	-	23,201
Caswell	57,217	-	-	4,387	150	-	43,900	-	8,780
Catawba	46,229	-	-	-	-	514	22,856	-	22,859
Chatham	121,818	-	-	-	-	11,721	59,632	4,587	45,878
Cleveland	33,238	-	-	-	639	-	27,942	-	4,657
Davidson	87,354	-	-	-	208	1,698	45,237	-	40,211
Davie	34,108	-	-	-	-	332	29,500	-	4,276
Durham	31,541	-	-	-	-	-	15,771	15,770	-
Forsyth	56,599	-	-	-	-	-	8,707	21,769	26,123
Franklin	30,093	-	-	-	-	-	30,093	-	-
Gaston	32,810	-	-	116	744	-	18,257	-	13,693
Granville	62,274	-	2,592	5,318	-	-	46,001	-	8,363
Guilford	68,560	-	-	-	-	758	38,744	-	29,058
Iredell	74,819	-	-	25	129	-	43,555	6,222	24,888
Lincoln	36,849	-	-	-	-	1,030	26,864	-	8,955
Mecklenburg	43,315	-	-	-	-	-	4,812	9,626	28,877
Montgomery	141,540	25,013	-	-	447	12,080	42,198	14,333	47,469
Orange	62,616	-	-	-	-	2,359	45,192	-	15,065
Person	59,885	-	-	-	459	-	44,570	4,952	9,904
Polk	30,102	-	-	-	-	3,253	4,475	4,475	17,899
Randolph	193,382	4,182	-	-	1,449	-	88,662	-	99,089
Rockingham	78,494	-	-	-	-	459	65,028	4,335	8,672
Rowan	52,446	-	-	-	-	-	34,963	5,827	11,656
Rutherford	129,961	-	-	-	-	11,396	30,930	10,310	77,325
Stanly	51,446	-	-	-	-	-	46,301	-	5,145
Stokes	85,495	-	-	-	110	-	35,951	-	49,434
Surry	109,530	-	-	-	775	-	84,040	-	24,715
Union	63,573	-	-	4	507	-	51,596	-	11,466
Vance	18,502	-	3,000	-	-	-	15,502	-	-
Wake	77,063	-	-	-	-	-	14,451	9,633	52,979
Warren	67,631	-	-	-	-	-	57,969	-	9,662
Yadkin	36,772	-	-	30	49	853	23,894	-	11,946
All Counties	2,255,583	29,195	5,592	9,880	5,678	49,967	1,249,573	111,839	793,859

Table 6.--Coastal Plain - Acres of commercial forest land classified as highly susceptible to defoliation, by ownership and county.

County*	All Ownerships	National Forest	Misc. Federal	State	County and Municipal	Forest Industry	Farmer	Misc. Pri. Corporate	Misc. Pri. Individual
Bertie	2,764	-	-	-	-	-	-	-	2,764
Bladen	7,400	-	-	-	-	-	7,400	-	-
Columbus	9,744	-	-	-	-	5,970	3,774	-	-
Craven	4,038	1,945	2,093	-	-	-	-	-	-
Cumberland	12,944	-	6,822	-	-	-	3,061	3,061	-
Duplin	4,034	-	-	-	-	4,034	-	-	-
Edgecombe	13,080	-	-	-	-	-	13,080	-	-
Greene	3,493	-	-	-	-	-	3,493	-	-
Halifax	41,993	-	-	-	-	2,924	24,376	-	14,693
Harnett	40,629	-	-	-	-	-	28,129	-	12,500
Hoke	7,692	-	4,953	-	-	-	2,739	-	-
Johnston	35,026	-	-	-	-	-	24,518	-	10,508
Lee	51,486	-	-	-	-	-	36,775	-	14,711
Martin	2,879	-	-	-	-	-	2,879	-	-
Moore	91,805	-	-	-	-	4,751	55,268	700	31,086
Nash	34,105	-	-	-	-	1,061	18,024	-	15,020
Northhampton	24,792	-	-	-	-	3,840	8,979	-	11,973
Onslow	3,524	-	-	-	-	-	3,524	-	-
Richmond	24,136	-	-	-	-	1,828	14,872	-	7,436
Scotland	3,037	-	-	-	-	-	3,037	-	-
Wayne	10,960	-	-	-	-	-	10,960	-	-
Wilson	5,356	-	-	-	-	-	2,678	-	2,678
All Counties	434,917	1,945	13,868	-	-	24,408	267,566	3,761	123,369

* Counties which are not listed have no highly susceptible forest.

Table 7.--Mountains - Volume of hardwood sawtimber and growing stock on commercial forest land, by county.

County	Thousand Board Feet			Thousand Cubic Feet		
	Total	Highly Susceptible to Defoliation	% Highly Susceptible to Defoliation	Total	Highly Susceptible to Defoliation	% Highly Susceptible to Defoliation
Alleghany	238,493	148,160	62	79,666	55,311	69
Ashe	459,444	176,888	39	159,802	46,842	29
Avery	314,767	15,279	5	147,895	17,155	12
Buncombe	1,039,015	207,382	20	331,853	74,627	22
Burke	391,468	190,573	49	160,280	85,913	54
Caldwell	548,732	323,946	59	240,299	153,483	64
Cherokee	468,800	167,979	36	191,121	71,375	37
Clay	285,133	94,588	33	94,903	33,198	35
Graham	575,558	74,304	13	189,467	33,016	17
Haywood	885,961	200,513	23	287,189	66,567	23
Henderson	565,722	113,206	20	190,892	39,404	21
Jackson	918,254	268,213	29	324,444	105,218	32
McDowell	715,667	319,650	45	261,195	126,040	48
Macon	913,845	290,600	32	323,651	97,970	30
Madison	769,772	228,603	30	279,274	78,761	28
Mitchell	510,796	71,095	14	193,850	21,471	11
Swain	272,692	66,729	24	93,522	21,552	23
Transylvania	665,839	321,508	48	239,452	128,661	54
Watauga	358,322	6,335	2	138,079	3,335	2
Wilkes	732,591	319,409	44	315,150	139,022	44
Yancey	789,953	-	-	250,723	4,661	2
All Counties	12,420,824	3,604,960	29	4,492,707	1,403,582	31

Table 8.--Piedmont - Volume of hardwood sawtimber and growing stock on commercial forest land, by county.

County	Thousand Board Feet			Thousand Cubic Feet		
	Total	Highly Susceptible to Defoliation	% Highly Susceptible to Defoliation	Total	Highly Susceptible to Defoliation	% Highly Susceptible to Defoliation
Alamance	334,338	212,481	64	110,449	66,204	60
Alexander	176,366	110,591	63	75,972	54,681	72
Anson	177,679	49,556	28	82,249	26,455	32
Cabarrus	239,855	138,178	58	82,770	48,951	59
Caswell	337,836	173,398	51	126,871	68,463	54
Catawba	268,294	169,671	63	76,536	54,372	71
Chatham	739,342	441,682	60	280,009	161,950	58
Cleveland	176,267	90,935	52	63,755	35,542	56
Davidson	550,034	403,973	73	181,754	129,143	71
Davie	172,176	129,368	75	60,498	45,877	76
Durham	185,195	44,066	24	74,733	26,486	35
Forsyth	263,310	190,235	72	108,605	80,578	74
Franklin	344,882	111,533	32	125,759	37,788	30
Gaston	229,022	104,393	46	83,376	41,709	50
Granville	400,468	126,146	31	165,360	60,128	36
Guilford	658,264	392,241	60	204,700	123,922	61
Iredell	401,038	242,235	60	146,475	100,496	69
Lincoln	228,191	151,364	66	80,191	54,725	68
Mecklenburg	436,932	185,443	42	112,289	45,411	40
Montgomery	365,971	244,786	67	175,355	126,436	72
Orange	492,335	236,716	48	170,184	85,707	50
Person	229,912	166,404	72	97,262	67,366	69
Polk	226,780	57,377	25	79,554	22,585	28
Randolph	653,061	583,220	89	268,047	227,653	85
Rockingham	310,708	190,455	61	135,571	87,578	65
Rowan	366,514	198,082	54	122,298	58,157	48
Rutherford	403,389	316,570	78	163,457	124,418	76
Stanly	239,109	192,808	81	83,693	64,216	77
Stokes	280,746	235,359	84	120,916	92,998	77
Surry	327,986	243,473	74	148,941	116,121	78
Union	325,342	152,131	47	139,696	73,134	52
Vance	150,917	50,665	34	59,741	23,294	39
Wake	804,696	243,933	30	261,856	84,658	32
Warren	318,419	106,107	33	130,445	57,377	44
Yadkin	195,356	144,192	74	77,915	48,973	63
All Counties	12,010,730	6,829,767	57	4,477,282	2,623,552	59

Table 9.--Coastal Plain - Volume of hardwood sawtimber and growing stock on commercial forest land, by county.

County*	Thousand Board Feet			Thousand Cubic Feet		
	Total	Highly Susceptible to Defoliation	% Highly Susceptible to Defoliation	Total	Highly Susceptible to Defoliation	% Highly Susceptible to Defoliation
Bertie	896,612	6,504	1	311,620	4,181	1
Bladen	539,015	9,367	2	185,093	5,045	3
Columbus	635,237	71,609	11	232,534	21,415	9
Craven	457,552	27,523	6	154,375	8,392	5
Cumberland	158,969	45,727	29	78,599	11,625	15
Duplin	488,262	-	-	178,250	1,399	<1
Edgecombe	509,306	30,036	6	160,222	11,749	7
Greene	113,554	3,204	3	46,327	1,914	4
Halifax	830,429	82,079	10	281,947	38,738	14
Harnett	244,375	86,820	36	97,258	34,788	36
Hoke	110,709	20,171	18	38,921	7,549	19
Johnston	667,053	82,610	12	213,910	31,267	15
Lee	170,723	72,283	42	88,169	42,836	49
Martin	497,405	6,302	1	163,218	1,977	1
Moore	318,290	162,760	51	146,122	75,783	52
Nash	533,058	105,870	20	171,818	39,145	23
Northhampton	643,185	60,776	9	216,185	23,216	11
Onslow	227,081	1,986	1	85,653	1,166	1
Richmond	186,497	19,748	11	71,729	11,540	16
Scotland	65,834	1,070	2	24,134	1,809	7
Wayne	166,377	18,511	11	64,718	7,326	11
Wilson	306,013	1,148	<1	112,097	3,189	3
All Counties	8,765,536	916,104	10	3,122,899	386,049	12

* Counties which are not listed have no highly susceptible forest.

Table 10.--Mountains - Forested land classified as highly susceptible to gypsy moth defoliation and in close proximity to urban buildup or recreation areas.

County	Highly Susceptible	Highly Susceptible and Near Urban or Recreation Areas
	- - - - - - - - - - acres - - - - - - - - - -	
Alleghany	47,355	6
Buncombe	87,401	15,735
Cherokee	96,369	4,964
Henderson	36,025	7,205
McDowell	116,247	14,526
Mitchell	14,473	6,946
Swain	38,266	25,772
Transylvania	99,922	7,339
Yancey	9,156	9,156
Totals	545,214	91,649

Table 11.--Piedmont - Forested land classified as highly susceptible to gypsy moth defoliation and in close proximity to urban buildup or recreation areas.

County	Highly Susceptible	Highly Susceptible and Near Urban or Recreation Areas
	- - - - - - - - - - acres - - - - - - - - - -	
Alamance	60,842	5,070
Alexander	57,736	5,421
Cabarrus	40,603	5,800
Caswell	57,217	8,780
Davidson	87,354	15,079
Davie	34,108	8,428
Durham	31,541	5,257
Forsyth	56,599	13,061
Gaston	32,810	860
Guilford	68,560	14,529
Iredell	74,819	12,444
Mecklenburg	43,315	9,626
Montgomery	141,540	10,550
Person	59,885	459
Polk	30,102	4,475
Randolph	193,382	11,879
Rockingham	78,494	17,343
Stanly	51,446	5,144
Stokes	85,495	13,482
Surry	109,530	4,944
Wake	77,063	4,816
Warren	67,631	4,831
Yadkin	36,772	11,947
Totals	1,576,844	194,225

Table 12.--Coastal Plain - Forested land classified as highly susceptible to gypsy moth defoliation and in close proximity to urban buildup or recreation areas.

County	Highly Susceptible	Highly Susceptible and Near Urban or Recreation Areas
	- - - - - - - - - - acres - - - - - - - - - -	
Craven	4,038	2,093
Hoke	7,692	4,953
Johnston	35,026	3,503
Lee	51,486	3,677
Moore	91,805	3,454
Wilson	5,356	2,678
Totals	195,403	20,358

Forest Pest Management
Asheville Field Office

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